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ABSTRACT

Approaches to studying the relationships between stress and school organizational sources of stress were examined. Rather than sampling a number of schools and school average data indicating school health and stress levels in these schools, simple teacher samples and teacher-level analyses were used. For a sample of 1300 high school teachers in Connecticut, the correlation values obtained using teacher scores on measures of burnout, need satisfaction, and school characteristics were compared with the values obtained from school mean data on the same variables from the same data set. The results indicated that the methodology did matter, and that correlation values obtained directly from teacher scores were not indicative of the role of school organizations in teacher stress. Although the evidence supported the presence of organizational sources of teachers' distress, it is suggested that they were not as important as role-related or individual sources of distress. (GDC)

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THE UNIT OF ANALYSIS IN THE STUDY OF THE RELATIONSHIP OF TEACHER STRESS TO SCHOOL VARIABLES

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THE UNIT OF ANALYSIS IN THE STUDY OF THE RELATIONSHIP OF TEACHER STRESS TO SCHOOL VARIABLES

Introduction

In 1974 the psychiatrist Freudenberger coined the term "burnout" to describe clinic staff who experienced emotional exhaustion from their work. Since that time many psychologists and social workers have asserted that the phenomenon he described is prevalent throughout the social service industries, and have voiced concerns about its effects on the individuals, their professions, and the quality of services they provide.

One element of this professional interest has been the identification of the characteristics of the work place that may be contributing to job stress. Numerous work conditions have been cited as possible causes, including too little pay, too much work, lack of appreciation, student discipline problems, lack of support, and organizations that don't respond to the needs of the client. (Cherniss, 1980; Edelwich & Brodky, 1980; Pfifferling & Eckel, 1982). These and other writers (Iwanicki, 1983; Maslach, 1978) suggest that the organization should be changed to ameliorate these conditions as much as possible.

One step in a research program to support this view is to determine the relationship between worker stress and the hypothesized job-based sources of stress. But such studies may incur the "ecological fallacy" noted by Robinson (1950) by making meas-

urements on one level, the worker level, and drawing inferences about another level, the work organization level. This paper is written to explore the issue of level of analysis as it applies to the study of teacher stress and schools.

Problem Statement

A class of methodological problems arise when research involves both aggregates and the individuals that comprise the aggregates. Whenever data are obtained at one level and inferences are made concerning the relationships at another level, the inference may result in the ecological fallacy as discussed by Robinson (1950). In the present case writers on stress are arguing that the levels of stress in schools are systematically related to the characteristics of the school as a whole. Thus, when data are obtained from individual teachers about their perceptions of the school and their own stress, and these data are not aggregated by school for analysis, it may be fallacious to conclude that results reflect the hypothesized school-level effects rather than teacher-level effects. Such a conclusion can only be validly drawn when the data and analysis are organized at the school level (Cronbach, 1976; Knapp, 1977).

These problems are in principle solved; the methodological literature provides clear direction on how to gather and analyze data to avoid them. But some researchers may not be familiar with this literature, or may not recognize its application to

this area of inquiry. A second problem is that it may not always be easy for researchers to conduct studies in the most ideal way. While the aggregation issue certainly applies in principle to this area of research, it may not be empirically important. It may therefore be important to know whether the ideal but difficult methods produce different answers than the intuitive and simple methods when studying organizational sources of teacher stress. The major problem of the present study is to determine whether indeed it is necessary to expressly study schools in future studies of the sources of teacher stress. The related purpose is to alert researchers on stress to the possible pitfalls and to provide methodological guidance.

Theoretical Rationale

A Framework for Studying Stress in Schools. Iwanicki (1983) has provided a suitable framework for studying the sources of teacher stress by integrating theory in the area of school organizational behavior with the stress research literature. Aspects of that framework guide this inquiry. Iwanicki (1983) argues that teacher distress can be seen as having three major sources or elements: societal distress, organizational distress, and role-related distress. This study employed the organizational and role components of this framework.

In this view, organizational distress arises from the conditions of work. Iwanicki proposes that the Miles (1969) model of

organizational health is a viable approach with which to investigate organizational sources of distress. The purpose of Miles' general model of school organizational functioning was to help understand the innovation process in schools and the critical influence of the setting on the effectiveness with which innovations were installed. Part of this model of school functioning was a set of 10 organizational characteristics which he called collectively 'organizational health'. These characteristics refer not to specific school tasks, persons or forms of organization, but rather to the underlying patterns of behavior and relationships that typify the way all school tasks are undertaken. These 10 dimensions are grouped into three components: The task-centered component, the internal state component, and the growth and changefulness component. The task-centered component consists of goal focus, communication adequacy, and optimal power distribution. The internal state component consists of resource utilization (effective use of people), cohesiveness, and morale. The growth component includes innovativeness, autonomy, adaption, and problem solving adequacy.

Role-related distress results from the personality and preparation of the teachers as they relate to the job. Poor attitudes, low motivation, and lack of specific skills are potential factors in role-related distress. Role-related distress was represented in this study by teacher motivation. Teacher motivation was represented in turn by need satisfaction as conceived by Mas-

low (1943) and as adapted later by Porter (1961) for the study of motivation in the work place. Defined as the difference between desired and obtained need satisfaction at work, it has a demonstrated relationship both with stress and with school organizational variables (Anderson, 1980; Carver & Sergiovanni, 1971; Pierson & Archambault, 1982, .

The present research used the definition of stress developed and validated by Maslach and Jackson (1981). In this definition, stress or burncut has three phases or aspects: emotional exhaustion, depersonalization (distancing from colleagues and clients), and a lack of a sense of personal accomplishment.

The use of the Iwanicki framework to define a specific model of school stress and the test of this model is a separate subject which will be addressed in a forthcoming paper. At present the focus will be upon simple correlation relationships between stress and other variables in his framework.

Methodological Framework. Historically, discussion of the ecological fallacy originated in the field of sociology where some researchers had erred by using group mean data to infer relationships pertaining to individuals. At the same time, educational researchers were raising questions about the "unit of analysis" when it was realized that in curriculum research and other situations, analysis of mean scores was more pertinent to the study of treatment effects than the traditional use of individual scores. These two concerns and streams of thought have

converged in the theoretical work of Burstein (1975), Cronbach (1976), Cronbach and Snow (1977) and Hannan (1975).

The heart of the proper approach is the clear specification of the theoretical base. Each construct, theory and research question should be particularly clear about the intended aggregation level (Cronbach, 1976; Hopkins, 1982). In many educational studies, more than one level will be investigated. Sampling strategies and analytical procedures are then devised to fit the particulars of the study.

In a simple two-level study, the larger group (e. g., schools) will usually be sampled first, and lower-level units (e. g. teachers) would then be drawn from those aggregates selected. The analysis must recognize that X and $\bar{X}$ are two different theoretical variables. In Cronbach (1976), all pertinent theoretical questions about aggregates must use the mean scores $\bar{X}$ and $\bar{Y}$, while questions about units must employ the deviation scores $(X - \bar{X})$ and $(Y - \bar{Y})$. The observed scores X and Y are not interesting except to illustrate the fallacy of ignoring this issue.

The present study will use all three scores for each variable in the study for the study of correlations among variables. Deviation scores and mean scores will be used to compute teacher-level and school-level correlations respectively; the observed scores will be used to calculate the correlation values that would have been obtained with a simple survey sample of teachers. These three sets of correlation values will be used to address the following research questions:

Research Questions

1. Is there a pattern of school-level relationships between teacher stress and school organizational health variables?
2. If so, can these correlation values be accurately estimated from observed score data without recourse to grouped analysis?

Review of Related Literature

The following review of the literature will first outline some of the major methodological developments pertaining to aggregation issues. This will be followed by a summary of major empirical support for relationships of teacher stress with organizational health, need satisfaction, and the personal and professional variables used in the study.

Aggregation in Research Methodology

Historically there has been a literature pertaining to the ecological fallacy and to contextual effects, and a largely separate literature concerning the unit of analysis. The former studies are associated with sociology, economics, and political science, while the latter is associated more with education. This review will provide some background to the terms and the literature describing them. This will be followed by a synopsis of the current view which sees the two linked by a common situation, namely research which directly or indirectly involves both members and the collectives to which they belong.

The Ecological Fallacy. Sociologists and political scientists frequently have access to data aggregated at various levels such as city and state, without access to the individual data. They are tempted to use such data to infer relationships among individuals. When this is done, a cross-level inference is being made. Such an inference is hazardous. Robinson (1950) computed the correlation coefficient between literacy and national origin when data were aggregated by census tract, and found $r = -.619$, that is, that foreign born were more frequently literate than native born. He re-computed the coefficient using the data on individuals and found $r = +.118$. This was an example of what came to be known as the "ecological fallacy", a cross-level inference that was unwarranted. Note that the two coefficients differed in sign as well as in magnitude. Robinson's warning attracted attention to a problem that now has a substantial literature.

Robinson's warning triggered interest in the sources of the ecological fallacy as well as clearer thinking about aggregation levels and relationships. For example, Lazarsfeld and Menzel (1966) made the distinction between individual and collective properties. One of the latter types is the contextual property, a property of the collective attributed to the individual by virtue of membership. The relationship of the contextual relationship to the ecological fallacy was spelled out by Firebaugh (1978) who defined the contextual effect as

$$Y_{ij} = a + b_1 X_{1i} + b_2 \bar{X}_j, \quad \text{when} \quad b_2 \quad \text{is not zero.}$$

where Y_{ij} is the dependent variable for the ith person in the jth group;

X_i is the predictor for the ith person;

$\bar{X}_j$ is the mean of X for the jth group;

b_1 and b_2 are regression coefficients;

a is a constant.

A contextual effect exists when the value of the individual variable Y depends upon the group mean $\bar{X}$ as well as the individual variable X, i. e., when the regression coefficient b_2 is not zero.

Aggregate data can be used to infer individual relationships if it is known that

$$b_2 = 0.$$

Hammond (1973) and Hannon and Burstein (1974) further clarified the conditions when sampling artifacts could have the same consequences as contextual effects in biasing estimates of r. Hammond also provided some empirical tests for aggregation bias. Burstein (1975) investigated the mathematics of inferring individual relations from grouped data more comprehensively using structural equations.

Unit of Analysis. In educational research, problems related to aggregation have a different character and have been associated with the term unit of analysis. Data such as test scores are usually obtained on individual children so that the specific

problem besetting sociologists does not arise. But the education treatments being studied are often applied to groups such as classrooms. The question that has arisen in these cases is what statistical analysis should be employed.

The traditional use of individual student scores was opposed because educational treatments were applied to classrooms as a whole, and because classrooms should consequently be the sampling unit. This conclusion was troublesome because it imposed a need in curriculum research to employ many classrooms, thereby making this research difficult, and because there was no role for the individual scores. Hopkins (1982) joined with Cronbach (1976), Cronbach and Snow (1977) and Cooley (1979) in approaching the question by placing prime importance on problem definition. He provided some resolution by pointing out that if the proper model is employed then procedures such as nested analysis of variance will not only give the treatment effect, but will yield rich supporting analyses.

Cronbach (1976) resolved the basic questions about aggregation and integrated the unit of analysis and ecological fallacy literature. He set forth the central role of the theoretical model and its implications for sampling and analytical procedures. Ordinarily theoretical questions will be aimed at both aggregate and member levels. Consequently, groups will be sampled first, and a portion of the members will be sampled from these. Analytical interest is as a consequence focused separate-

ly on group mean data, and as previously noted, deviation scores. While both the between-group and pooled within-group regressions are of prime analyical interest, Cronbach further pursues the deviation of within-group regressions slopes from the pooled value. This means that the test for homogeneity of regression is of particular interest in the understanding of the relationships in many studies. Cronbach and Webb (1975) and Cronbach and Snow (1977) further explore this issue and specific procedures.

Organizational Variables and Teacher Stress

Quantitative research on the relationship of teacher stress to organizational variables has taken two forms, correlation research and what might be termed stress event research. Stress event research follows the pattern established by Hahe et al. (1965) in the study of general, life events. In their pioneering study, people were asked to rate the relative stressfulness of a list of hypothesized stressors to which most people are exposed. A high degree of consensus on these ratings was established, and the instrument resulting from the study has been used both as a measure of life stress (e.g. Barineau, 1981) and as a predictor of subsequent ailments (e.g. Chiriboga, 1982). This approach has been used in a number of studies to help identify sources of stress in teaching.

The application of stress event research to job stress has its basis in clinical experience which seems to be the main

source of hypothesized organizational stressors. Some of the work done in this area has a substantive theoretical aim, but the identification and selection of hypothesized stressors is, from an organizational point of view, essentially atheoretical. Therefore as the outcomes of these studies are examined in relation to the dimensions of organizational health two limitations are emphasized: 1) these studies provide preliminary evidence concerning which job aspects may be related to teacher stress. As such they provide selective support for the use of the organizational health dimensions for the study of job related stress in teachers as outlined below. 2) Because of the atheoretical basis, the cited stressors as formulated do not necessarily fit neatly into the organizational health categories.

Stress event research provides the most unequivocal support for the internal state or organizational maintenance functions, resource utilization, morale and cohesiveness. Two of the most frequently cited concerns relate to job or time pressure and to excessive paperwork, which are aspects of resource utilization. Also in this category are complaints of the shortages of materials and equipment, ineffective organization, unrealistic expectations from supervisors and lack of support or consultation functions. School holidays which provide rest to stressed personnel may also belong in this category (Bausch, 1981;Cichon & Koff, 1980; Fletcher & Payne, 1982; Kyriacou & Sutcliffe, 1978; Olson & Matuskey, 1982; Turk & Litt, 1982).

Several studies have cited situations or problems that appear to be related to morale. Lack of recognition or concern generally, and lack of recognition for extra effort in particular (Kyriacou & Sutcliffe, 1978) is one aspect of this. Kyriacou and Sutcliffe also cite poor attitudes and behavior on the part of the school leader and colleagues, and poor student attitudes as part of an overall concern with "school ethos". Satisfaction with seeing results or lack of such satisfaction (Fletcher & Payne, 1982) appears to be another aspect of school morale that may be related to teacher stress.

Lack of concern and support is also cited frequently as being important to teachers in connection with job stress (Fletcher & Payne, 1982; Turk & Litt, 1982). This complaint may be most strongly related to a lack of cohesiveness in the school, a sense that staff don't pull together.

Some support for organizational health factors in other components may be found as well. Two cited school factors are related to Optimal Power Equalization: One is too little teacher influence on key decisions that affect day to day work, and the other is too little teacher discretion to handle one's own job in one's own way. While it is conceiveable that teachers could have too much responsibility, there is little indication that teachers often register this complaint. Rather they feel the pressure of changes imposed from above, which may solve other people's problems, but at the expense of extra work for the teacher. They

also feel frustration from not being given permission to things in the classroom in their own way, or at having to get such permission. In a correlational study Bausch (1981) concluded that abuse of power is related to stress in secondary teachers.

Outside of these four dimensions, support for the importance of other aspects of organizational health as potential sources of teacher stress is less strong. Turk and Litt (1982) indicate in a correlational study that "negative well-being" is related to community relations, but the data of Fletcher and Payne (1982) suggest that teachers do not seem to have major concerns with how the school functions in relation to parents (autonomy and adaptiveness);rather it is dealing with individual parents that can be problematic. Lemaster (1981) examined the relationship of stress to organizational climate, and the data supported a relationship with the "Openness" dimension, suggesting that Communication Adequacy could be a school organizational factor in teacher stress.

Clear support for other aspects of organizational health such as problem solving does not appear to emerge directly from the cited literature. It is, of course, possible that some of the dimensions of organizational health may not be related to stress. But the Miles' constructs are strongly interrelated, and evidence supporting one of these constructs may also tend to support others as well, even if the formulation of item stems or the naming of derived factors in the cited research does not make it

evident. On balance, we think that the empirical work done thus far tends to provide substantial support for the use of Miles' conception of organizational health as a reasonable basis for conceptualizing and measuring the range of hypothesized and supported sources of stress in school organizations.

Role-related Sources of Stress. The grounded theory of Blase (1982) provides empirical support for Iwanicki's concept of role-related distress. In Blase's theory, teacher satisfaction, motivation involvement, and coping resources are key factors in sustaining a pattern of work effort. These two views are very close in this respect.

Correlational research has been conducted on several significant role variables, including locus of control (McIntyre, 1981), role conflict and role ambiguity (Pierson & Archambault, 1982; Schwab, 1980) and need satisfaction.

Anderson (1980) studied the relationship of the five aspects of need satisfaction as defined by Porter (1961) to teacher stress. She found that two of the higher level needs, self-actualization and esteem, were significantly related to stress. They were most strongly related to Emotional Exhaustion and less strongly related to Depersonlization and Personal Accomplishment. In a multiple regression study of teacher stress, Pierson and Archambault (1982) used need satisfaction and along with several other predictors and found that, for classroom teachers, self-actualization and social needs were significant predictors of

stress, with somewhat different patterns for the different aspects of stress. These two studies provide strong support for a relationship between need satisfaction and teacher stress.

Personal and Professional Variables and Stress

Numerous studies examining the relationship of stress to various background variables have been conducted. Perhaps the most important of these is professional role. Fimian (1982) compared regular and special education teachers, and Pierson and Archambault (1982) compared Social Workers, Psychologists, Reading Consultants, Guidance Counselors and Classroom Teachers. Both studies found significant and somewhat complex differences among these groups.

Studies of teacher sex, age and teaching experience have had mixed results. For example, Kyriacou and Sutcliffe (1978) found no differences. But most studies have found differences in levels of stress in teachers grouped on these variables (Anderson, 1980; Crane, 1981; Fimian, 1982; Raison, 1981; Schwab, 1980).

Studies of educational level, class size, grade level taught and other variables have generally found little support. See Fimian (1982) for a detailed review.

In sum, the important background variables seem to be professional role, sex, age and experience of the teacher.

Implications for the Present Inquiry. Cronbach's concerns have now been echoed by Cooley (1979), Hopkins (1982), Pedhazur

(1982) and others. Consideration of this literature indicates that the investigation of the relationship between teacher stress and school characteristics requires special handling of the both the sampling procedures and analysis. First of all, care need be given to note the type of properties and relationships that are being studied. Furthermore this literature suggests that when both the collectives and and the members are objects of study, both should be sampled.

Next, these writers advise that correlational analysis should not be analyzed using the observed scores. Rather, the scores should be partitioned into between- and within-class components and analyzed separately to obtain between-class and within-class correlations. Finally, it calls attention to the special importance of homogeneity of regression, indicating that the data should be tested in this regard, with follow-up analyses if necessary.

Methodology

Research Design

The major objective of the study was to compare the total correlation, within groups correlation and the between groups correlations for the relationships between three stress variables and school organizational health characteristics, a motivational variable, and three demographic variables. The study used sample survey research methodolgy to address this objective. Both

schools and teachers were objects of study, and therefore a two-stage sample was used. A sample of schools was drawn, and teachers from these schools were asked to complete survey questionnaires on school as well as teacher variables. All of the survey data was collected during the period spanning from mid-April to mid-May of 1983. The design is a post-hoc design, and causal inferences can only be drawn with risk. The design controlled for teacher role by sampling only regular classroom teachers, and for grade level taught by sampling only high schools and high school teachers. Three personal and professional variables, teacher sex, age and experience, served as statistical controls as well.

Instrumentation

Teacher Stress. Perceived teacher stress was measured using a self-report measure, the Maslach Burnout Inventory (MBI), with two adaptations. The MBI measures three dimensions of stress or burnout: emotional exhaustion, depersonalization, and (lack of) personal accomplishment. The 22-item MBI measures the emotional exhaustion scale with nine items, the depersonalization scale with five items, and the personal accomplishment scale with eight items. The term "client" used in the original was replaced by the term "student" as done by Schwab (1980). Each item in the original was rated on two scales, one for the intensity of occurence, and one for the frequency of occurence of certain experiences. Only the intensity scales were used in this study, as

suggested by Iwanicki and Schwab (1981). The intensity scales rate each item on a 7-point scale. Values 1 through 7 describe a range from "barely noticeable" to "very strong", and a "not applicable" response is also available.

The MBI authors report extensive data in the manual supporting the content and construct validity of the instrument (Maslach & Jackson, 1981). Content validity was established by basing items on clinical experience and a review of the items in similar scales. Construct validity was supported using correlations with the ratings of co-workers and spouses, and a variety of job characteristics. The factor composition and scale reliabilities of the teacher version were supported in work by Iwanicki and Schwab (1981).

Need Satisfaction. Need satisfaction was measured using the Porter Need Satisfaction Questionnaire (PNSQ) as adapted by Trusty and Sergiovanni (1966). Porter (1961) devised the original instrument to investigate applications of Maslow's theory of a heirarchy of needs in the business world. For his purpose he added a need for "autonomy" and deleted the need for "physical needs" as originally formulated by Maslow. In the version used, respondents answer 13 items on a 7-point scale, once to obtain desired ratings and a second time to obtain actual ratings. The score for each item was the difference between the desired and actual ratings.

The factor composition of the PNSQ has been studied by Weber and Hadd (1974) and by Waters and Roach (1973). Similar instruments were also examined by Roberts, Walter and Miles (1971) and Payne (1970). Of these four studies only the work by Weber and Hadd provided support for a five-factor scoring based on Porter's judgemental scales, and their data is somewhat ambiguous. Consequently the PNSQ was scored as a single factor in this study. Test-retest reliability of the PNSQ as a single factor was found to be .83 for a sample of 30 managers (Dore & Meacham, 1973).

The PNSQ and the MBI were professionally typeset and printed on a single form using the wording of Trusty and Sergiovanni, along with items for the demographic variables and a letter of introduction.

Organizational Health. The Miles' model of organizational health includes 10 dimensions grouped into three components. An experimental instrument, the Organizational Health Instrument, Form B, (OHI), measures the 10 Miles' dimensions with 80 items on a 5-point Likert scale with response options ranging from "strongly agree" to "strongly disagree".

The prototype of the instrument used was developed at the University of Arkansas by Hardage (1978) and Lucas(1978), who produced different parts of this instrument in separate but coordinated efforts. Two shorter versions of this instrument were subsequently developed from the prototype, which was too long for many practical applications. Items were selected for these from

the original using step-wise multiple regression in which the total score in the prototype was the dependent variable (Holmes, 1979). This procedure is not standard and some questions therefore remained about the factorial composition of the instrument.

The construct validity of the prototype and Form A was demonstrated by replicating a study used for the prototype. These data showed that the subscales of the OHI significantly discriminated between healthy and unhealthy schools. Scales were also shown to correlate with the ratings of central office administrators from .51 to .67 (Holmes, 1979; Fairman et al., 1979).

The same multiple regression procedure was repeated to create Form B (used in the present study) from the items remaining in the pool after the creation of Form A (Fairman et al., 1979). Some of the item stems were also reworded in Form B although they closely resemble the corresponding items in the prototype. There is no indication that the validity studies conducted for the other versions were replicated for Form B. Because of the methods involved in its construction, this might be a problem inasmuch as the items may no longer be as representative of the domains of each of the dimensions measured as was the prototype. Form B was the form sent by the publisher for this study. As in Form A the factor structure and scale reliabilities of Form B have apparently not been reported (Fairman, et al, 1979). Such a determination for Form B is a peripheral objective of the study.

The OHI and response sheet are integrated on a professionally printed "op-scan" sheet provided by the developers.

Sample

The study used a two-stage sample. First, a simple random sample of 50 Connecticut public high schools was drawn to be representive of public high schools in the state. In the second stage an average of 26 teachers per school was drawn from rosters provided by the principal to be representative of regular classroom teachers. The population of teachers varies widely among schools, i.e. from 25 to 120 teachers per school. Over-sampling would be expensive and time-consuming. Therefore the sample was designed for equal precision of estimate of the variable means in each school. The precision of the sample, or standard error of the mean, with finite population correction, is given by

$$\text{Est. Precision} = s * \text{sqrt}(1 - n/N) / \text{sqrt}(n)$$

where s is the standard deviation of the variable whose mean is being estimated, n is the sample size, and N is the teacher population size (Cochran, 1977). The sample was then designed with a total sample of 1300 teachers. The sampling fractions from this procedure ranged from 75% in the smallest schools to 25% in the largest, roughly 20 to 30 teachers per school.

Data Collection Procedures

Data collection involved four steps. First, the endorsement of the Connecticut Association of Secondary Schools (CASS) was obtained in order to encourage the support and participation of school principals. Second, a initial letter was sent to sampled school principals describing the study, indicating the CASS endorsement, and requesting support and a current roster of classroom teachers from which to draw the teacher sample. Third, the survey materials were sent to the schools for distribution. Fourth, a follow-up letter was sent through principals to non-respondents after two weeks. These procedures resulted in 883 returns; this study was able to use 786 (60.5% of 1300) of these responses.

Analyses

The first step was to examine the OHI with the purpose of developing factors and scale scores for use in subsequent analyses. These procedures included principal components analysis with oblique rotations and internal consistency reliability estimates. Scale scores for each person were found by summing the responses across items defining the factors.

Computation of Correlations. Methods for the computation of correlations at different levels is summarized by Knapp (1977). Correlations obtained using observed scores can be computed with conventional formulas using the sums of squares and sums of cross-products. This is termed the total correlation:

$$r_{txy} = \frac{SCP_{txy}}{(SS_{tx} * SS_{ty})^{1/2}},$$

Correlations with group mean data are called ecological or <u>between-groups correlations</u> and the correlations among deviation scores are <u>within-groups correlations</u>. To obtain these values, the sums of squares of variable X can be partitioned into between-groups and within groups components. This process can be repeated for variable Y and for the sums of cross-products. Then

$$r_{bxy} = \frac{SCP_{bxy}}{(SS_{bx} * SS_{by})^{1/2}}, \text{ and}$$

$$r_{wxy} = \frac{SCP_{wxy}}{(SS_{wx} * SS_{wy})^{1/2}}.$$

When these three values of r have been obtained for a given relationship, they are found to be related as follows:

$$r_{txy} = n_x * n_y * r_{bxy} + ((1 - n_x^2)(1 - n_y^2))^{1/2} * r_{wxy},$$

where

$$n_x^2 = SS_{bx}/SS_{tx} \quad \text{and} \quad n_y^2 = SS_{bx}/SS_{tx}.$$

Equivalent computations of total-, between-, and within-groups correlations form the basis of results presented below.

Calculation of the significance levels for correlations must take into account the different degrees of freedom for the correlations at each level. For total correlations there are N-1 degrees of freedom; for within-groups correlations there are N-K degrees of freedom, and for between-groups correlations there are K-1 degrees of freedom.

Results

Detailed results from the psychometric study of the OHI were complex and will be presented in detail elsewhere. For the present purpose, the major results will be outlined in order to understand the data being used for the purposes at hand.

The factor analysis produced 13 factors, 7 of which were judged reliable enough for this study. However, the 7 derived factors did not correspond as closely as might be expected to the 10 factors that the developers tried to build into the instrument. The judgemental factors designed into the OHI, the derived factors used in this study along with the number of items and internal consistency reliabilities are presented in Table 1.

The first derived factor termed Leadership involved the collapse of two dimensions, Communication Adequacy and Problem Solv-

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ing, into a single factor with 19 items and correspondingly high reliability. Derived scales Cohesiveness and Adaptiveness each strongly resembled the original or judgemental factors. Items intended to measure Morale produced two factors. One of these we named Morale; the second had items referring to time pressure and paperwork which we thought better fit Miles' definition of Resource Utilization. The reliability of this scale was lower than desired, but we thought that the importance of these issues in these stress literature warranted retaining it. Items from the Autonomy dimension referred to teacher autonomy rather than school autonomy, and we renamed this factor Optimal Power Equalization, in keeping with our understanding of Miles' intent. A factor with many items from the Goal Focus dimension did not appear to fit well with Miles' definition. We called it Planning and note that we did not see it as a dimension of organizational health. The original or judgemental scales of Optimal Power Equalization, Resource Utilization and Innovation did not produce reliable factors of their own, but some of the items did appear in the derived factors that we used.

We now turn to the study of correlations between the three dimensions of stress (i. e., emotional exhaution, depersonalization and personal accomplishment) and seven organizational variables, need satisfaction and three control variables.

TABLE 1

Major Results of the Analysis of the OHI

Judgemental Factors	Derived Factors	No. of Items	Alpha Rel.
Problem Solving Commun. Adequacy	Leadership	19	.96
Cohesiveness	Cohesiveness	10	.88
Adaptiveness	Adaptiveness	6	.70
Morale	Morale	6	.81
	Resource Utilization	6	.64
Autonomy	Optimal Power Eq.	7	.81
Goal Focus	Planning	8	.81
Optimal Power Eq.	--		
Resource Utilization	--		
Innovation	--		

Computational Example

Table 2 below presents all the data pertinent to the relationship between "Emotional Exhaustion" and "Leadership". The table includes the total sums of square for the first variable, the within sums of squares, the between sums of squares, and finally the correlation ratio, eta squared. The corresponding data is also given for the second variable. Below these data are the sums of cross-products for the pair of variables, first for the

observed or total level, second for the within level, and third for the between level. Below the sums of cross products are the correlations. These can be computed using a standard formula, the sums of cross-products divided by the square root of the product of the sums of squares for each variable:

$$r = \frac{SCP}{(SS_{ee} * SS_{ldr})^{1/2}}.$$

In practice the correlations were obtained by computer from three different data sets representing the total, within and between scores respectively, and checked using this method.

TABLE 2

Computation of Correlations from Sums of Squares

	Total	Within	Between	Eta^2
		Sums of Squares		
Emot Exh	121124.	109996.	11128.	.092
Leader	182445.	130139.	52306.	.287
		Sums of Cross Products		
EE x Ldr	48565.	38262.	6298.	
		Correlations		
EE x Ldr	.300	.320	.261	

Correlation Values Compared

Table 3 presents all of the correlations at each level. Correlations with Emotional Exhaustion are presented in the top third of the table, and those with other stress variables below. Each of the organizational, motivational, and control variables are listed. For each one, the total correlation, the within-schools correlation, and the between-schools correlation is given, followed by its correlation ratio, eta squared. The correlation ratio for each stress variable is given at the top of each section respectively. Asterisks indicate statistical significance at less than .05.

The correlation ratios were significant but modest for Emotional Exhuastion and Depersonalization (9% and 8%). The value for Personal Accomplishment was only slightly less but was not statistically significant. The smaller value indicates that there is less between-schools variation in this variable, and therefore less likelihood of finding correlations with other varibles at the school level.

Correlation ratios for the analytical variables are all significant. The largest (.29) is for Leadership; this suggests that schools differ the most in the way the principal operates. Other characteristics, which depend on the whole staff, are more uniform from school to school. There are no significant differences among schools with respect to the percentage of males or females or age, and the differences with respect to teaching experience are small though statistically significant.

TABLE 3

Correlations and Correlation Ratios

Variable	Total	Within	Between	Eta^2
Correlations with Emotional Exhaustion (eta^2 =09*)				
Leadership	30 *	32 *	26 *	29 *
Cohesiveness	27 *	30 *	06	17 *
Res. Utilization	42 *	41 *	50 *	16 *
Adaptiveness	23 *	26 *	05	20 *
Opt. Power Eq.	32 *	32 *	28 *	15 *
Morale	42 *	45 *	33 *	26 *
Planning	20 *	22 *	12	23 *
Need Satisfaction	46 *	47 *	32 *	11 *
Sex	-05	-05	02	07
Age	-06 *	-08 *	+15	08
Experience	-02	-03	11	09 *
Correlations with Depersonalization (eta^2 = 08 *)				
Leadership	22 *	22 *	27 *	29 *
Cohesiveness	25 *	26 *	18	17 *
Res. Utilization	27 *	26 *	40 *	16 *
Adaptiveness	24 *	23 *	36 *	20 *
Opt. Power Eq.	24 *	24 *	27 *	15 *
Morale	31 *	31 *	38 *	26 *
Planning	19 *	16 *	40 *	23 *
Need Satisfaction	33 *	32 *	42 *	11 *
Sex	-15 *	-17 *	+14	07
Age	-08 *	-07 *	-15	08
Experience	-	-	-14	09 *
Correlations with Personal Accomplishment (eta^2 = 07)				
Leadership	-14 *	-14 *	-20	29 *
Cohesiveness	-18 *	-19 *	-11	17 *
Res. Utilization	-10 *	-10 *	-14	16 *
Adaptiveness	-16 *	-17 *	-13	20 *
Opt. Power Eq.	-18 *	-18 *	-18	15 *
Morale	-21 *	-22 *	-18	26 *
Planning	-19 *	-18 *	-28 *	23 *
Need Satisfaction	-25 *	-24 *	-27 *	11 *
Sex	05	06	-02	07
Age	02	04	-18	08
Experience	-02	-02	-02	09 *

Total and within-school correlation values with the three stress variables are significant for all the analytical variables and for some of the background variables. These two coefficients are very nearly the same for any given pair of variables. The largest difference is about 3 points.

The between-school correlations with Depersonalization were significant with every variable except age. Significant correlations with Emotional Exhaustion are found with five of the theoretical variables; with Personal Accomplishment only two are found.

Comparing total correlations with between-school correlations reveals little pattern. Between school values can be higher than the total correlation (Depersonalization and Resource Utilization), about the same as the total correlation (Depersonalization and Optimal Power Equalization), or much lower than the total correlation (Emotional Exhaustion and Cohesiveness).

Discussion and Conclusions

The results first show that there is a pattern of significant between-groups relationships between stress variables and organization variables. Of the 33 relationships examined, 14 showed statistically significant between-school correlations. These correlations range from .27 to .50, and seem to be important. We therefore conclude in answer to the first research question that selected organizational variables are indeed related to stress variables at the school level. Thus, the ecological fallacy is potentially involved in the area of teacher stress

when relationships with sources of organizational stress are being studied.

Scanning the total, within and between level correlations shows that a there is a close, nearly perfect relationship between total and within school correlation values. Most of values in this data set are within one or two points; none are farther apart than three points. At the same time, there is little if any relationship between the correlations obtained from observed scores and the between groups correlation values. Thus, there are not only significant between groups correlations, but they cannot readily be estimated by using data that is not first analyzed by groups. Therefore, the answer to the second question is that one cannot count on accurately estimating school-level relationships between teacher stress and school variables except through a study which is specifically designed for this purpose.

At the same time, the correlation ratios for teacher stress are low, 5 - 10%. Thus, while there are major relationships between school characteristics and average levels of teacher stress in those schools, it is also the case that the variation in stress levels <u>within</u> each school is a far more prominent aspect about the distribution of stress levels. While it necessary to study schools in order to examine these relationships, our data show that these relationships appear to be of limited importance in the overall picture. They suggest that variations in the way individual teachers relate to their school and in the way they perceive their school are on the whole more germane objects of study. In sum, the study provides evidence supporting the pres-

ence of organizational sources of distress, but suggests that they are not as important as role-related or individual sources of distress.

Recommendations

The study produces two recommendations for those researching the sources of teacher stress. These recommendations are completely consistent with the advice of Cronbach and others on the matter of aggregation in educational research:

1. Determine at the outset whether the purpose is to study
   a) ways in which the total job environment affects everyone in the organization, or
   b) individual differences in the way teachers relate to their job environment.
2. If the purpose is the former, be prepared to undertake the expense and methodological challenges which are necessary to address this type of question.

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